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# *Twisselmannia* (Brassicaceae), a Remarkable New Genus from California

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**ABSTRACT.** *Twisselmannia californica*, a new genus and species from Kings County, California, is described and illustrated. Its relationships to other mustard genera are discussed.

To the foreign reader, the discovery of a new genus from the United States would seem rather unusual, especially for a family like the Brassicaceae (Cruciferae), which has recently been treated for North America in the outstanding monograph by Rollins (1993). Although most of the North American flora north of Mexico is well known, numerous discoveries continue to be made, and it is estimated that several hundred new taxa remain to be discovered and named from the United States alone (Ertter, in press; Milius, 1999). Hartman and Nelson (1998) indicated that 1197 new taxa of vascular plants, including five genera based entirely on newly described species, were discovered in the United States and Canada between 1975 and 1994. Of these, 91 taxa belong to the Brassicaceae, and 217 (ca. 18%) were discovered from California alone. Recent outstanding discoveries in the Brassicaceae from California include the new genus and species *Sibaropsis hammittii* S. Boyd & T. S. Ross (Boyd & Ross, 1997) and *Arabis hirshbergiae* S. Boyd (Boyd, 1998).

The remarkable new discovery, hereafter known as *Twisselmannia californica*, is based on a single specimen collected in 1994 and was nearly passed over by its collector as the common weed *Capsella bursa-pastoris* (L.) Medikus (Andrew Sanders, pers. comm.). It was sent initially to Reed C. Rollins who for reasons of deteriorating health never had the time to study it. The specimen, along with many others left in Dr. Rollins's office after he died, were loaned to me in November 1998. Upon a casual look at the specimen, it was immediately evident that it does not belong to any known genus in the Brassicaceae. Critical further study, as well as a thorough checking of Schulz (1936) and all the major floras of the world, supported the fact that the plant is a native new species that belongs to an undescribed monotypic genus. The saltbush scrub habitat in which *T. californica* grows belongs to a

private property of ca. 1700-acre parcel land in Kings County that is up for development into an "instant city," an action that would have resulted in the total destruction of the habitat (Andrew Sanders, pers. comm.) and perhaps the extinction of the species. It was planned that I and several colleagues would look for *T. californica* in late February 1999 before I formally described it. However, due to the drought this year in that part of California and because of the immediate need to protect the habitat in which it grows, it became necessary to publish a formal account without delay.

The genus, anecdotally referred to as the Kings Gold, is named in honor of Ernest C. Twisselmann (1917–1972), rancher and tireless botanical explorer of the arid lands of south-central California, whose name is synonymous with floristic works on the Inner South Coast Ranges. His initial attempt to compile a simple list of the plants on the Twisselmann family ranches culminated in "A flora of the Temblor Range and the neighboring part of the San Joaquin Valley," all potential habitat for additional populations of *Twisselmannia*. He subsequently authored "A flora of Kern County, California." His floras (Twisselmann, 1956, 1967) continue to inspire several of the most enthusiastic floristicians in California.

Although the opportunity to honor Ernest Twisselmann with his own genus could not be passed by, credit must also be given to the discover, Ed LaRue, whose keen-sighted recognition of this anomalous mustard resulted in the fortuitous collection of the sole specimen currently known.

***Twisselmannia*** Al-Shehbaz, gen. nov. TYPE: *Twisselmannia californica* Al-Shehbaz.

Herba annua; folia caulina pinnatisecta; racemi ad apicem bracteati, valde elongati; sepala oblonga, nonsaccata; petala lutea; stamina 6, tetradynama; fructus obdeltoidei, valde compressi, puberuli, valvis in dimidio inferiore carinatis, laevibus et tenuiter coriaceis, in dimidio superiore rotundatis, tuberculato-rugosis et crasse coriaceis vel sublignosis; septum valde angustatum; semina 4–8, oblonga, nonmucilaginosa; cotyledones incumbentes.

Herbs annual. Trichomes unicellular, eglandular, simple and minutely forked. Stems erect, few

branched basally. Basal leaves not seen; cauline leaves short petiolate, not auriculate, pinnatisect. Inflorescences many-flowered, somewhat dense racemes, bracteate to their apices, elongated considerably in fruit; rachis straight; bracts similar to cauline leaves, progressively smaller upward. Fruiting pedicels rather slender, terete, ascending-divaricate. Sepals oblong, deciduous, erect, glabrous, base of inner pair not saccate, margins narrowly membranous. Petals yellow, slightly longer than sepals, oblanceolate-obovate, apex rounded; claw obscurely distinct from blade. Stamens 6, tetradynamous; filaments filiform, dilated at base; anthers ovate, obtuse at apex. Nectar glands confluent, narrowly subtending bases of all stamens. Ovules 4–8 per ovary. Fruit dehiscent silicles, obtriangular, strongly flattened and angustiseptate, sessile; valves veinless, puberulent with simple and forked hairs, keeled, thin leathery and smooth on proximal half, rounded, thick leathery or subwoody, and tuberculate-rugose distally, wingless; gynophore absent; septum complete, very narrow; style slender, persistent, glabrous; stigma capitate, entire. Seeds 2–4 per locule, uniseriate, wingless, oblong, plump; seed coat minutely reticulate, not mucilaginous when wetted; cotyledons incumbent.

***Twisselmannia californica*** Al-Shehbaz, sp. nov.

TYPE: U.S.A. California: Kings County, S of Kettleman City, E side of Interstate Hwy. 5, 3 mi. N of the Kern County line, grazed valley saltbush scrub with *Atriplex confertifolia*, *Frankenia salina*, *Astragalus oxyphysus*, *Bromus hordeaceus*, *Deschampsia danthonioides*, and *Hordeum depressum*, 30 Mar. 1994, *Ed LaRue s.n.* (holotype, UCR). Figure 1.

Herba annua; caules 7–25 cm longi, pilosi, trichomatibus ad usque 1.5 mm longis; folia caulina et bracteae petiolatae, pilosae, pinnatisectae, lobis lateralibus oblongis vel oblongi-linearibus, 2–8 × 0.5–2 mm, integris; sepala oblonga, 1.2–1.5 × 0.7–0.9 mm; petala lutea, oblanceolato-obovata, 1.6–2.1 × 0.7–0.9 mm; pedicelli fructiferi tenues, pilosi, inferiores ca. 28 mm longi, superiores ca. 3 mm longi; fructus 4–5 × 4–5 mm, puberuli, trichomatibus 0.1–0.25 mm longis; replum anguste lineare, 4–5 × 0.3–0.4 mm; stylum 0.3–0.9 mm longum; semina oblonga 1.2–1.5 × 0.6–0.9 mm.

Herbs annual. Stems 7–25 cm tall, slender, erect, terete, pilose throughout with simple trichomes to 1.5 mm long. Basal leaves not seen; cauline leaves petiolate, pilose as on stem; petiole ca. 1 cm long, shorter upward; leaf blade 2.5–4.5 cm long, pinnatisect; lateral lobes 2–4 on each side, oblong to oblong-linear, 2–8 × 0.5–2 mm, entire; terminal lobe 1.5–2× larger than lateral ones. Fruiting racemes bracteate throughout, elongated

considerably; bracts similar to cauline leaves, gradually reduced in size upward. Sepals oblong, 1.2–1.5 × 0.7–0.9 mm, glabrous, narrowly membranous at margin. Petals yellow, oblanceolate-obovate, 1.6–2.1 × 0.7–0.9 mm, cuneate into a short claw. Filaments white, median pairs 1.2–1.4 mm long, lateral pair 0.9–1 mm long; anthers ovate, 0.3–0.4 mm long. Fruiting pedicels divaricate-ascending, slender, pilose, lowermost to 28 mm long, uppermost to 3 mm long. Fruit a silicle, 4–5 × 4–5 mm, strongly angustiseptate, obdeltoid, veinless, puberulent with simple and minutely 1-forked trichomes 0.1–0.25 mm long; valves strongly keeled, smooth, and thin leathery on lower half, rounded, tuberculate-rugose, and thick leathery to subwoody on the outer part of distal half, minutely ciliate near margin along line of attachment to replum; replum narrowly linear, 4–5 × 0.3–0.4 mm; septum to 0.1 mm wide; style slender, 0.3–0.9 mm long. Seeds 2–4 and in upper half of each locule, oblong, brown, 1.2–1.5 × 0.6–0.9 mm.

Although the fruit shape of *Twisselmannia* somewhat resembles that of *Capsella* Medikus, the two genera are quite different in many characters. *Capsella* has stellate trichomes, ebracteate inflorescences, auriculate cauline leaves, smooth, distinctly veined, and thin fruit valves, and up to 40 seeds per fruit. By contrast, *Twisselmannia* has simple and minutely 1-forked trichomes, bracteate inflorescences, nonauriculate cauline leaves, tuberculate-rugose, veinless, and thick fruit valves, and up to 8 seeds per fruit.

Because of its pinnatisect leaves and thick, tuberculate-rugose, angustiseptate fruit valves, *Twisselmannia* bears some resemblance to *Coronopus* Zinn. *Coronopus* differs in having ebracteate inflorescences, 2-seeded fruits, completely closed valves, rudimentary septum, and exclusively simple trichomes, whereas *Twisselmannia* has bracteate inflorescences, 4–8-seeded fruits, open valves, distinct (though narrow) septum, and simple and forked trichomes.

Both *Capsella* and *Coronopus* are represented in North America by introduced weeds, and these genera are definitely unrelated to *Twisselmannia*. None of the New World Brassicaceae genera appears to be closely related to *Twisselmannia*, and the remarkable fruit morphology (with valves thin leathery, keeled, and smooth on the lower half and thick leathery or subwoody, rounded, and tuberculate-rugose on the upper) clearly sets it apart from all genera of the family. *Twisselmannia* is perhaps related to *Mancoa* Weddell, a genus of about ten species distributed in Texas, Mexico, and dis-

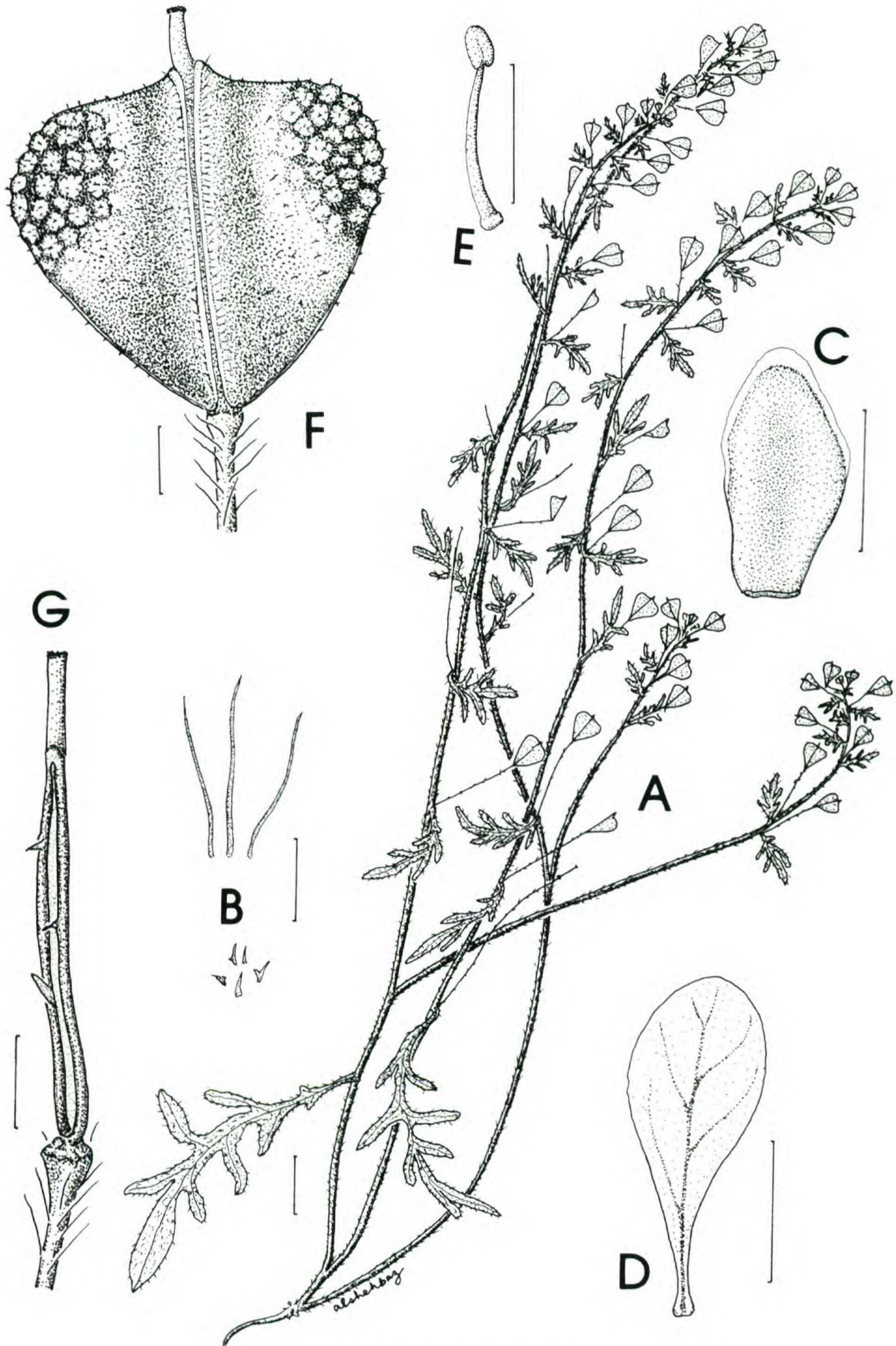


Figure 1. *Twisselmannia californica* Al-Shehbaz. —A. Plant. —B. Trichomes: long ones of leaves, stems, and pedicels; short ones of fruit valves. —C. Sepal. —D. Petal. —E. Stamen. —F. Fruit. —G. Fruit after removal of valves and seeds. Scale: A = 1 cm; B–G = 1 mm. Drawn by Al-Shehbaz from the holotype.

junctly into South America (Argentina, Bolivia, Peru). However, the differences between these two genera are substantial. *Mancoa* has oblong fruits, papery, smooth, rounded, readily dehiscent, and widely opened valves, biseriate seeds (15–)40–100 per fruit, filiform and long funicles, and broad replum to 2.5 mm wide. *Twisselmannia* has obtriangular fruits, leathery, distally tuberculate-rugose, basally keeled, tardily dehiscent, and nearly closed valves, uniseriate seeds 4–8 per fruit, stout and short funicles, and narrow replum to 0.4 mm wide.

Other genera with angustiseptate fruits, which are widely distributed in California, the adjacent southwestern U.S., and Mexico, include *Dithyrea* Harvey and *Dimorphocarpa* Rollins, but these are readily distinguished from *Twisselmannia* by their didymous fruits, 1-seeded valves, ebracteate inflorescences, decurrent stigmas, dendritic trichomes, obsolete septum, and undivided leaves (for comparison, see Rollins, 1979).

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*Note added in proof.* Dean Wm. Taylor and Barbara Ertter are thanked for making a special effort to re-collect *Twisselmannia californica*. Their search for the plant in the type locality and five other sites on 25 March 1999 resulted in the discovery of several small plants in an area of perhaps two square meters in association with *Atriplex spinifera*, not *A. confertifolia*, as stated in the collection data of the holotype. Of these, only a few plants were collected, and they represent the following paratypes:

CALIFORNIA. San Joaquin Valley, Kings County, ca. 13 miles S of Kettleman City, along pipeline access road lying 0.3 mi E of Interstate 5, at a point along the freeway 3.1 road mi. N of Kern County line, 217 ft. alt., T24S R20E SE1/4 NE1/4 Section 22, 35°49'41"N, 119°48'16"W, West Camp 7 1/2' USGS quadrangle, sub-alkaline, sandy clay in *Atriplex spinifera* scrub, flowers yellow, 25 Mar. 1999, *Dean Wm. Taylor 17098 & Barbara Ertter* (MO, UC).